BENTON LAKE NATIONAL WILDLIFE REFUGE

Personnel

Lyle A. Stemmerman, Refuge Manager, GS-11 - EOD 08/06/73 PFT
Elizabeth A. Benway, Administrative Clerk, GS-5 - EOD 07/22/68 PFT
Dean C. Rodman, Engineering Equipment Operator, WG-10 - EOD 08/20/61 PFT
Vincent J. Marko, Maintenanceman, WG-8, EOD 04/30/62 - PPT (39 hours)
Willie J. Nelson, Conservation Aid, WG-1, EOD 05/24/76 - Term. 08/20/76
Temporary

Review and Approvals

01/28/77			
Submitted by	*Date*	*Area Office*	*Date*
Benton Lake National Wildlife Refuge			
		Regional Office	*Date*

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I. GENERAL

A. Introduction

The Benton Lake National Wildlife Refuge is located approximately twelve miles north of Great Falls, Montana.

The refuge is a native grass complex containing six large man made impoundments.

The refuge administers the wetlands program in the following Montana counties: Glacier, Toole, Liberty, Hill (west half), Pondera, Teton, Chouteau, Cascade, Lewis and Clark and Powell.

B. Climate and Habitat Conditions

A precipitation guage and evaporation tank are maintained at refuge headquarters. The following data was collected during 1976.

Month	Precipitation Inches	Pan Evaporation Inches
January	.32	
February	.19	
March	.29	
April	1.41	4.18
May	1.03	7.83
June	3.17	6.68
July	1.16	9.32
August	2.53	8.38
September	.42	6.43
October	.13	4.10
November	.65	
December	.28	
Total	11.58	46.92

C. Land Acquisition

1. Fee Title

The Fish and Wildlife Service obtained title to the following tracts (Wetland Acquisition Program).

Tract Name	Tract No.	County	Total Acreage
Brumwell	10,a	Teton	251.5
Furnell	15,a	Toole	1657.0
McCormick	10,a	Powell	300.0
Total			2226.5

2. Easements

As of December 31, 1976, the status of the easement program was as follows:

County	Number of Easements Taken	Total Acreage Under Easement
Teton	1	800
Glacier	6	2,324
Toole	28	25,267
Liberty	9	6,200
Pondera	7	8,335
Total	51	42,926

3. Other

Nothing to report.

D. Systems Status

1. Objectives

System status is poor. Objectives have not received an approved revision since originally developed in 1971. Informed revisions were made in 1973. These revisions have not been reviewed by higher authority. The 1973 revisions are now out of date. They do not include lands and easements being acquired through the wetlands acquisition program. A complete revision process is anticipated each year. We await the revised procedural format.

The foundation for the PPBE system is the objective setting process. With objectives in their current outdated and disorganized status program scheduling is difficult and imprecise at best.

Coordination of PFMIS and PPBE is non-existant. We are advised by memo and word of mouth that the two systems can be coordinated. Instructions for coordination are lacking.

Conflicts between program management (work plan advices) and the refuge objective setting procedure have been identified. A program advice can render the conclusions of a refuge objective invalid. The refuge objective can be revised to conform using the program advice as a mandate.

Is it really a mandate? Such a program advice can appear one year and not appear in work plan advices the subsequent year. What is its status? Is it still to be considered a mandate in the objective setting process?

Program managers should be more aware of the disruptive effects advices can have on objectives. If program advices are to be regarded as objective mandates careful consideration should be given to their preparation and wording.

2. *Funding*

Currently the refuge is staffed with a refuge manager (GS-11), refuge clerk (GS-5), equipment operator (WG-10) and maintenance-man (WG-8).

The equipment operator will retire in December, 1977. A new staffing pattern will be developed. Additional employees are required, particularly during the work season (April - October) if we are to meet the demands of an expanding program.

Planning allowances by activity are as follows:

Activity	*FY 76*		*FY 77*
1200	*$79,000*	*1210*	*$85,000*
1500	*6,000*		*6,000*
3110	*5,000*		*4,500*
Total	*$90,000*		*$95,500*

In recent years 1200 monies have been adequate to conduct routine operations and to keep pace with rehabilitative maintenance needs. The current level of funding will not allow us to keep pace with the development, maintenance and management needs of acquired wetlands.

Interpretation and recreation monies permit the conduct of routine operations only. They will not permit much needed program improvements or planned expansion.

For Fiscal Year 1977 there is a reimbursable account available for the repair of flood damage. This program is discussed in detail below.

II. CONSTRUCTION AND MAINTENANCE

A. Construction

The Fish and Wildlife Service entered into a cooperative agreement with the Soil Conservation Service. Under the terms of the agreement the Soil Conservation Service will reimburse the Fish and Wildlife Service for funds expended to repair dike damage created by floods received in 1975.

In 1975 the refuge received 13,300 acre feet of flood waters. Water standing elevations of 3618.8 (0.8 foot above design maximum) resulted in Pools 3, 4, 5 and 6. Subsequent wind and wave action resulted in moderate to severe damage to 11.2 miles of dike facing.

The repair project calls for the placement of rip-rap in the existing erosion cut to protect against future damage. Without such protection the dikes would be breached in the event of a future flood.

Force account work on the project commenced this summer. In Pools 3 and 6 the grader was utilized to shape the existing erosion cut for rip-rap placement (3.1 miles). In Pool three 0.75 mile of dike facing had been damaged to a point that slope replacement was mandatory. This work has been accomplished.

A new access road (870 feet by 18 feet) was constructed to facilitate truck access to the dike system. This road was surfaced with six inches of one and one-half inch crusher run material (626.77 tons).

A contract for the placement of 7,090 cubic yards of rip-rap material will be awarded early in 1977. Completion of this contract will provide the required protection for 6.5 miles of dike facing fully protecting Pools 3 and 4.

As of this writing there has been no decision as to what action will be taken on the remaining 4.7 miles of damaged dike facing (full protection for Pools 5 and 6).

B. Maintenance

1. Safety

Arranged for an inspection of electrical facilities to ascertain if they met current codes and standards. Numerous minor deficiencies were noted. They have been corrected by a licensed electrician.

2. *Energy Conservation*

All refuge buildings contained insufficient attic insulation. The two residences and the heated portion of the metal shop building received six inches of Weyerhauser silva-wool fiber insulation. Insulation factors were increased from R11 to R33. The office and equipment storage building received four inches of additional material increasing the insulation factor from R22 to R33.

The heated portion of the metal shop building contained 4 foot by 4 foot single pane windows. Four tension sealed interior windows were installed to reduce heat loss.

The heated portion of the metal shop building contained two 16 foot by 14 foot metal doors. Two inch styrofoam panels were installed on the inside of both doors to reduce heat loss.

Quarters 81, vacant at this time, was equipped with a new thermostat. When unoccupied temperatures may now be maintained at 45° F.

Lined drapes were installed on the six office windows reducing heat loss, particularly on cold windy days.

3. *Hunting Program*

Pool 5 was opened to hunting for the first time in several years. New facilities were required. A parking lot (120 feet by 75 feet) and an access road (642 feet by 15 feet) were constructed to provide hunter access. A second parking lot (231 feet by 51 feet) was also required. All areas received a six inch coat of one and one-half inch crusher run gravel (785.43 tons).

Eleven portable blinds were constructed of fiberglass and plastic tubing. These floating blinds provide suitable hunter cover in hunting areas that are void of emergent vegetation.

4. *Water Management Facilities*

Fall clean up operations at the Muddy Creek pumphouse were hampered by a faulty sump pump. A new pump was installed. Its design is more suitable for silt removal. Other renovations were made to facilitate the annual chore of removing silt and debris from the pumping basin.

Minor maintenance work was required on the Lake Creek ditch. A serious erosion problem which had developed at the outfall of the 48 inch concrete delivery pipe was corrected by dozer work and rip-rap placement. A new fill was constructed to provide the affected landowner with access to fields on either side of the ditch.

A Cummins diesel-generator unit acquired from surplus property was revamped to create a portable power unit for the Crisafulli pump.

A 24 inch CMP was installed in the dike-road separating Pools 3 and 5. This facility permits pumping operations between the two pools without closing the road to public use.

5. Other Items

Refurbished Quarters 82 as follows: new wallpaper in living room, dining area and kitchen. New floor covering in kitchen. Refinished kitchen cabinets.

Constructed three-fourths mile of new boundary fence.

Removed one-fourth mile of obsolete boundary fence.

C. Wildfire

None

III. HABITAT MANAGEMENT

A. Croplands

Farming operations are conducted to convert agriculture land to DNC.

Cooperator Lawrence Suek planted 66.5 acres (DNC Unit 3) to barley. He harvested 100% of this crop (40,040 pounds; 11 bushels/acre). The cooperator will assist in the establishment of DNC on this unit in 1977.

Pre-seeding treatment of DNC Unit 4 and portions of DNC Unit 2 (96 acres) resulted in the application of 150 pounds of 27-14-0 per acre. The areas were seeded with a 50-50 mixture of Tall Wheatgrass and Mandan 759 Pubescent Wheatgrass at a rate of 8 PLS pounds per acre.

The areas seeded to DNC developed a dense stand of volunteer barley. This standing hay crop was sold to the highest bidder ($760). An estimated 100 tons of hay was cut and removed.

Excellent dense nesting cover was developed on the 150 acres seeded in 1975.

B. Grasslands

1. Grazing Program

The grazing season was from July 1 through September 30, 1976. Eugene Suek (Unit 5-south) elected not to put cattle on the refuge until August 1.

The grazing fee was $3.10 per AUM. A cow and calf were regarded as 1¼ AUM. Grazing fees collected totalled $1,951.26.

Details of the grazing program are presented on the following chart:

Grazing Unit	Acres	Permittee	AUM's Used	AUM's/ Acre
1	720.5	Ewing	89.68	.12
2	576.0	Hinderager	98.68	.17
3	837.5	Golie	66.75	
		L. Suek	72.26	
			139.01	.17*
4	1036.0	Prinzing	81.00	
		White	84.75	
			165.75	.16
5 South	667.0	E. Suek	106.00	.16
Power	117.5	Lee	30.32	.26
Totals	3954.5	7	629.44	N/A

*Actual grazing pressure was lower as Pool 6 basin was dewatered during most of the grazing season and provided a significant portion of the forage consumed the latter part of the season.

2. Termination of Grazing Program

The grassland management plan approved in 1975 recognized a direct conflict between grazing of native grasslands and waterfowl production objectives.

In the spring of this year all permittees were advised that 1976 would be the last year that grazing would be permitted on Benton Lake. Of the seven individuals adversely affected by this decision, three indicated they would actively oppose it. Their opposition resulted in several Congressional inquiries.

Grazing might be considered in future years if it is demonstrated that it is necessary for management purposes.

3. Grit Stations

Nesting studies indicate a significantly higher level of nest activity in native grassland immediately adjacent to gravel roads.

During pre-nesting activity numerous females are observed on the road system. They are attracted there by flooded barrow ditches and the availability of grit. It is feasible that their association with the roads influences their selection of nest sites.

Four experimental grit stations were constructed in a native grassland area. Each station is a two foot high mound of dirt, 10 feet by 30 feet, with a gravelled surface. The mounds were dozed up in natural drainage ways. Small impoundments are likely in the early spring. If the trial grit stations prove effective in attracting pre-nesting use by waterfowl a study will be devised to evaluate their effectiveness in increasing nesting activity in the surrounding grasslands.

C. Wetlands

Water management is the most important operation at Benton Lake. Each year a detailed water management report is prepared and copies submitted to the Area and Regional Offices. No attempt is made to repeat the detailed information contained in that report.

In 1975 water management plans were disrupted by flooding. All pools were filled to design maximum elevations or above.

The water management objectives for 1976 were to: dispose of water, dewater selected pools and return to the planned program of subimpoundments and seasonal water level management.

At the beginning of the year the 6 marsh units stored an aggregate 11,116 acre feet of water (83% of design capacity). At the close of the year the aggregate storage was 4,230 acre feet (32% of design capacity).

Pools 3 and 6 were dewatered by pumping. This operation required 1,000 hours of Crisafulli pump operation. An estimated 1,100 acre feet of water was transferred from Pools 3 and 6 to Pools 4 and 5.

Botulism control calls for the maintenance of near maximum water levels within pools managed for brood habitat (i.e., inundated during the botulism season). To meet this objective pumps at the Muddy Creek Station were operated during June and July for a total of 2,658 hours producing 2,978 acre feet.

This was the second consecutive year without a botulism outbreak. Water management techniques employed to control botulism are believed to be having a beneficial effect.

In 1975 flood waters inundated Pools 4 and 5. Prior to the receipt of flood waters Pool 4 had been dry since the summer of 1971. Pool 5 had been managed by shallow spring - fall inundations and summer draw downs. Both pools contained large quantities of dry land vegetation when flooded.

Immediately following the receipt of flood water both pools presented relatively sterile habitat conditions. Submerged aquatics began to develop during the late summer of 1975. By mid summer of this year submerged aquatic development was outstanding. Habitat conditions were much superior to those of marsh units (1, 2 and 3) which had been subject to year round inundation for the last several years.

The exceptional habitat conditions produced by Pools 4 and 5 are responsible for much of the increased waterfowl use reported in Section IV.

D. *Forest Lands*

In the early years of refuge development numerous shelterbelt plantings were made. In total 150 acres were devoted to tree and shrub planting. These plantings failed on many sites (approximately 100 acres) due to saline seep and 2,4-D drift.

The remaining 50 acres have been maintained by clean cultivation throughout the growing season. In a cultivated state the plantings produce few observable wildlife benefits. In 1975 the decision was made to terminate cultivation on all but the headquarters area shelterbelt. By 1976 grasses and weeds were providing dense cover and the plantings were producing wildlife benefits.

It is probable that if not cultivated these plantings will die out after a prolonged period. So be it! There are few, if any, wildlife

benefits produced by shelterbelts maintained in a cleanly cultivated condition.

E. Other Habitat

Nothing to report.

F. Wilderness and Special Areas

The refuge segment of the Mullan Road received official designation as a National Historic Site.

G. Easements for Waterfowl Management

In the spring a portion of the easements under our jurisdiction were inspected by air. No violations were observed. 1st Time

IV. WILDLIFE

A. Endangered and/or Threatened Species

The following species of threatened animals are known to occur at Benton Lake:

American Peregrine Falcon	-	endangered
White-faced Ibis	-	status undetermined
Ferruginous Hawk	-	status undetermined
Prairie Falcon	-	status undetermined

The refuge is used sporadically by these species, usually during migration. No specific management programs are employed. 1976 observations were as follows:

American Peregrine Falcon - 04/28 - 2, 04/29 - 1, 05/19 - 1
White-faced Ibis - 05/03 - 2, 05/06 - 6, 09/08 - 29, 09/14 - 12

B. Migratory Birds

1. Waterfowl

a. Swans

Whistling Swan use was up considerably from that of previous years. Swan use days during the months of March and April, 1976, totalled 6075 as compared to 2070 and 1200 for the same period in 1974 and 75 respectively.

In 1976 the fall migration peaked at 550 birds, twice that of the normal fall concentration.

b. Geese

Seven pair of Canada Geese nested on the refuge. They produced a total of 43 goslings. The return of seven nesting pairs was a pleasant surprise considering the near total production failure recorded in 1975. why?

C. Ducks

Conditions were excellent for attracting breeding pairs. In May the marsh units impounded 5039 surface acres during the spring migration. Marsh acreage had averaged only 2,500 surface acres during the spring migrations of 1972, 73 and 74. Marsh quality was much improved over conditions prevalent in 1975.

An estimated 4,068 breeding pairs used the refuge in 1976. This was the highest pair population recorded since 1971. It represented a 220% increase over the 1975 breeding pair population.

Currently duck production estimates are developed as follows:

No. breeding pairs (assume all BP nest on refuge)
x 80% nesting success (developed from previous nesting studies)
= number of successful nests
x number of young/successful nest (average of all Class II and III broods observed)
= number of ducks produced

This year the reported production estimate was 21,750 ducks produced. Indications are that this estimate was substantially higher than actual production levels. The reported estimate was not authenticated by ground brood counts.

In 1977 joint aerial and ground brood counts will be performed. If aerial surveys result in significantly higher brood numbers than do ground counts, we will feel more comfortable with the current system for estimating duck production.

If there is little difference between ground and aerial brood counts, the system for estimating duck production will have to be revised.

In 1974 five permanent hunting blinds were constructed in Pool 4a. This project created small islands which were used by various species for nesting. The islands contained: 1 Canada Goose, 1 Mallard, 1 Scaup and 4 Redhead nests.

Islands have the potential to increase diver production. Numerous islands have been constructed at Benton Lake in past years. They were all obliterated by wave and ice erosion. This year four islands (40 feet by 10 feet) were constructed in Pool 6. They will be provided with rip-rap slope protection. If the rip-rap slope lends a degree of permanency to these islands more will be constructed in future years.

2. Marsh and Water Birds

On June 9 a Common Egret was observed in Pool 3. This is the first time this species has been recorded at Benton Lake. We have been advised that this was only the sixth record of this species for the State of Montana.

3. Shorebirds, Gulls and Terns

Dewatering of Pool 3 created a large expanse of mud flats during the spring and early summer. This condition produced intensive use by numerous species of shorebirds.

In early spring California Gulls concentrated on the site they used for a rookery in 1975. At that time this site was an island as per 1975 conditions. As Pool 3 was dewatered the site began to lose its island characteristics. Gull activity shifted to the Pool 3 dike. Though not an island, this site may have appeared suitable for nesting to the gulls. Water bordered each side of the dike. Disturbance was minimal (the dike was closed to vehicle travel).

On June 25 the rookery was checked for production activities. Fifty abandoned nests were observed. Twenty-four nests contained eggs. No young gulls were observed.

The rookery was visited again on July 10. It had been abandoned by gulls. No eggs or young observed.

The Pool 3 dike was not inaccessible to predators. There was a population of weasel present. Though there was no evidence of predation, it is probable that weasel or other predators were destroying eggs and/or consuming young gulls soon after they were hatched. Whatever the reason, the California Gull colony suffered a complete reproductive failure in 1976.

The Common Tern fared better in its attempts at reproduction. Three of the five blind islands in Pool 4a were used by Terns for nesting. A total of 58 nests were located. Production was estimated at 150 young.

4. Raptors

Nothing of significance to report.

5. Other Migratory Birds

A Red-breasted Nuthatch was observed in the headquarters area on August 29, 1976. This observation resulted in an addition to the bird list.

C. Mammals and Non-Migratory Birds and Others

1. Game Mammals

In the early 60's a small herd of Pronghorned Antelope used the refuge on an intermittent basis. Peak populations were as high as 80 animals. This small herd began to decline about 1970. Observations became more infrequent with fewer animals noted. There were no antelope observed on Benton Lake during 1976.

2. Other Mammals

A trapping plan was developed for the removal of muskrats. Permittee selection was accomplished on the basis of bid solicitation. The high bid for trapping privileges was $153.00. Through December 31 the permittee removed 155 muskrats, 3 mink and 1 weasel.

The resident population of Richardson's Ground Squirrel was virtually eliminated by a combination of weather events in 1975. (Estimate a 95% reduction in population.)

During 1976 ground squirrels were observed at isolated locations throughout the refuge. Populations remain way below pre-1975 levels.

3. Resident Birds

Nothing to report.

4. Other Animal Life

Nothing to report.

V. INTERPRETATION AND RECREATION

A. Information and Interpretation - Environmental Education

1. On Refuge

a. General Visitation

2, recorded as Recreation-Wildlife oriented Land Vehicle in 1977!

General visitation is defined as an auto tour of the refuge. The visitor may participate in one or more non-consumptive recreational activities. General visits occur primarily during the months of April through September.

This type of use is declining. During the period 1969 through 1973 an average of 11,300 visits per year were received. During the period 1974 through 1976 average per annual visits dropped to 8,800.

The total visits recorded in recent years are as follows:

1973	-	12,861 visits
1974	-	10,750 visits
1975	-	9,912 visits
1976	-	5,829 visits

There are several factors which may be contributing to the decline in refuge visitation.

(1) An interpretive auto tour established in 1969 probably stimulated refuge visitation. This tour has not been updated since originally developed. A revised more informational tour route is needed.

(2) Commencing in 1972 individual pools were drawn down seasonally or dewatered on a long term basis (botulism control). This action significantly reduced the acreage of marsh habitat during the summer months, possibly reducing the attractiveness of the refuge in the eyes of many visitors.

(3) There has been a significant decline in "EE" use of the refuge the past two years. The "EE" visits by 5th graders often generated subsequent family visits to Benton Lake.

b. Environmental Education

The Environmental Education program conducted on the refuge by the Great Falls School District produced 1300 to 1500 visits per year (1971 through 1974).

In 1975 weather conditions severely disrupted this program requiring frequent and continuing rescheduling of class trips. Several of the schools had to cancel their scheduled visits. Total student visits dropped to 1,000.

In 1976 the Environmental Education Department revised their program. Field trips were set up for May as opposed to April. Alternate field trips were developed and individual teachers could select the program they preferred for their students. Total student visits received in 1976 were 632.

c. Other

Conducted tours for two groups of Cub Scouts.

Met with permittees to discuss the grassland management plan and reasons for terminating grazing at Benton Lake.

Met with 17 area citizens who have a specific interest in the operation of the refuge. Discussed the grassland management plan and the grazing situation.

2. Off Refuge

Refuge Manager Stemmerman talked to the Fort Benton Kiwanis Club. The program was general information about the refuge.

Refuge Manager Stemmerman presented a talk to employees of the Montana Fish and Game Department at their annual regional meeting. Management of lands acquired via the wetlands acquisition program was the subject covered.

Refuge Manager Stemmerman presented a slide show at Malmstrom Air Force Base. The slide series presented various aspects of quality waterfowl hunting.

Stemmerman presented a slide show to the first and second grade classes at Skyline Grade School.

Met with numerous individuals and small groups in the Great Falls area to explain the need to terminate grazing operations at Benton Lake. Attempted to generate support for this endeavor.

B. Recreation

1. Wildlife Oriented

Waterfowl hunting is the most important recreational program at Benton Lake from the standpoint of output quantity.

During the 76 season (40 days before freezeup) 3,516 hunter visits were received producing 12,800 activity hours of recreation. Visits averaged a record 88 per day of season. This is a 16% increase over the previous high of 76 visits per day of season recorded in 1975.

In 1973 and 74 Benton Lake conducted an experimental steel shot hunting program. The use of steel disrupted normal hunting patterns so it was not possible to evaluate trend. Data from the 75 and 76 season indicates a substantial upward trend in waterfowl hunting activity.

No effort was made to evaluate harvest. It is not possible to comment on hunter success or kill by species.

The portable blinds constructed this year were a beneficial addition to the hunting program. They were intensively utilized by hunters. Pool 5 which provided 40% of the marsh acreage opened to hunting contained little in the way of natural hunter cover. Without the availability of portable blinds this unit would have made little or no contribution to the hunting program.

Though not enough data was collected to produce reliable information, the interviews conducted indicated that the blinds are an effective means of reducing crippling loss.

2. Non-Wildlife Oriented Recreation

Non-wildlife oriented recreation is not permitted.

The refuge contained a small picnic area equipped with minimal facilities. The site was intended to supplement wildlife oriented recreational visits. In practice the area was used for booze parties and other non permitted activities. Vandalism was common. The site received only minimal legitimate use. The facilities were removed and the area closed.

C. Enforcement

This refuge does not require significant enforcement efforts.

Throughout the year minor infractions occur. These are normally handled by courtesy warnings. Where appropriate, citations are issued.

Enforcement activities are necessary to maintain control during the hunting season. This year a total of 32 citations were issued. Most violations (17) involved late shooting. Hunting from refuge dikes was the second most common violation.

VI. OTHER ITEMS

A. Field Investigations

1. Nesting Studies

The current nesting study objective is to quantify nest densities on various cover types. The need is to cover large acreages. Only one drag is made on each individual area. Flushed hens are counted as a nest. Nest visitations are not made.

This year we were able to sample 310 acres of various cover types. The results are shown in the following chart:

Area Sampled	Total Acres	Total Nests	Nests/ Acre
DNC Unit 1 (part)			
Tall wheatgrass planted 1970*	11.6	0	0
DNC Unit 1 (part)			
Alfalfa strips planted 1970**	41.2	17	0.41
DNC Unit 6 (part)			
Strips seeded 1973	51.0	41	0.80
DNC Unit 7 (part)			
Strips seeded 1973	49.0	55	1.12
Native Grasslands			
All areas sampled	158.0	18	0.11
Portion of above - 80 - 260 feet from road	68.0	14	0.21
Portion of above - to 800 feet from road	90.0	4	0.04

* 1.12 nests/acre - 1972 studies
** 1.41 nests/acre - 1972 studies

Summary of Results

Nesting activity on DNC appears to decrease significantly as the age of the planting increases.

Recently established DNC areas are making a significant contribution to waterfowl production at this refuge.

There is an indication that roads (grit) may influence nest site selection.

2. *Native Grassland Evaluation Program*

A grassland monitoring program was developed. Seven permanent study sites were set up. Each study site represents the condition of an individual native grassland type.

In July of each year clippings taken from each study site are air dried and weighed. The result quantatatively evaluates production (total pounds forage per acre) of each grassland type.

July visual obstruction measurements are also taken. These measurements also quantify annual production for each grassland type.

It is anticipated that when enough data is collected that there will be a direct correlation between visual obstruction measurements and pounds of forage produced as determined by clippings. In the future it will be possible to index forage production rates by visual obstruction measurement.

Visual obstruction measurements will be taken the following spring. These measurements will quantify residual (pre-nesting) cover conditions for the various grassland types. They can be directly related to production quantities.

In summary, the above procedures will index the quantities of cover produced by the various grassland types on a year to year basis. Nesting study results can be related to quantified cover conditions.

To date not enough data has been developed to permit meaningful summarization.

3. *Fertilization Trial*

A fertilization study area was established. The objective was

to determine if a single application of fertilizer could significantly increase forage production on native grasslands for a period of several years.

This year the following results were obtained:

Treatment with 100 pounds N and 50 pounds P_2O_5 per acre:

This plot showed a 5% increase in cover production over that of the check plot when evaluated by visual obstruction measurement.

Treatment with 50 pounds N per acre:

This plot showed a 24% increase in cover production over that of the check plot when evaluated by visual obstruction measurement.

Treatment with 100 pounds N per acre:

This plot showed a 36% increase in cover production over that of the check plot when evaluated by visual obstruction measurement.

Treatment with 200 pounds N per acre:

This plot showed a 43% increase in cover production over that of the check plot when evaluated by visual obstruction measurement.

4. *Gizzard Collection*

For the past several years we have been collecting gizzards and wings from refuge hunters. These specimens have been analyzed for lead in an effort to ascertain the level of lead pellet ingestion associated with the refuge hunting program.

This year's collection effort was conducted in two phases. An opening day collection resulted in 500 gizzards. This collection would analyze ingestion rates associated either with residual lead at Benton Lake or with the duck population prior to its arrival at Benton Lake. The second phase collected gizzards on and after October 23. It is estimated that by late October 90% of the spent shot associated with the current hunting program had been deposited in the marsh. This collect would analyze the ingestion associated with the current hunting program. The following table represents the results of this year's gizzard collection program.

Species	Early Season Collection Col. 1	Col. 2	Col. 3	Late Season Collection Col. 1	Col. 2	Col. 3
Mallard	117	2	.017	37	3	.081
Gadwall	132	0	0	52	1	.019
Pintail	188	0	0	43	0	0
Wigeon	0	-	-	16	1	.062
G-W Teal	13	0	0	18	0	0
B-W Teal	13	0	0	4	0	0
Shoveler	30	0	0	22	0	0
Diver Species	7	0	0	15	0	0

Col. 1 = Number of gizzards collected
Col. 2 = Number of gizzards containing pellets
Col. 3 = Ingestion rate

Note all pellets found were lead. No iron pellets were found in this year's collection. With one exception all gizzards containing pellets contained only one pellet. This exception was a Mallard gizzard which contained seven pellets.

Conclusions made from this and previous gizzard collects are as follows:

The lead shot ingestion rate by species of ducks other than Mallard is insignificant. The following table combines the 1974, 75 and 76 gizzard collection data.

Species	Total Gizzards Collected	No. Gizzards W/Lead Pellets	Ingestion Rate
Mallard	429	16	.037
Gadwall	436	1	.002
Pintail	308	2	.006
Wigeon	127	1	.008
G-W Teal	70	0	0
B-W Teal	54	1	.018
Shoveler	118	0	0
Diver Species	32	0	0

Composite data shows an approximate ingestion rate of 4% for the Mallard. Though we are reluctant to come to any conclusions based on a sample of only 37 gizzards, it should be pointed out that all previous Mallard samples were heavily influenced by

early season collections. It is possible that after the first two weeks of the season the Benton Lake Mallard population is ingesting lead shot at the rate of 8%.

B. *Cooperative Programs*

Nothing to report.

C. *Items of Interest*

Nothing to report.

D. *Safety*

There were no lost time injuries during the year.

To the best of our knowledge the visiting public did not suffer any accidents or injuries.

The principal safety effort was the inspection and updating of electrical facilities previously described.